QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Department of Mathematics

Study plan No.	**2021/2022**		**University Specialization**	**Bachelor of Mathematics**		
Course No.	**0101475**		**Course name**	**Applied mathematics**		
Credit Hours	**3**		**Prerequisite/ Co-requisite**	**Partial Differential Equations**		
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	✓ **Mandatory requirements**	☐ Elective requirements
Teaching style	☐ Full online learning		✓ **Blended learning**		☐ Traditional learning	
Teaching model	☐ 1 Synchronous: 1 asynchronous		✓ **1 face to face : 1 asynchronous**		☐ 2 Traditional	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**
				Blended	

Brief description

Boundary value problems (Sturm- Liouville problem), Series solutions of ordinary differential equations, Fourier series, Fourier coefficients, Convergence of Fourier series, Sine and Cosine series, Fourier integration, Solutions of wave, Laplace and heat equations by Fourier series, Fourier solutions of the boundary value problems.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	1. Elementary Differential Equation and Boundary Value Problems, By William E.Boyce & Richard C. Diprima, 10th edition, 2013. 2. Fourier series by Georgi P. Tolstov, By Richard A. Silverman 1976. Dover Publications			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Fourier series and Orthogonal Functions, Harry F. Davis, 1989/ Allyn and Bacon. 2. Fourier analysis and its Applications, Andres Vertblad, 2003 / Springer-Verlage, New York 3. Mathematical Methods, Dr. S. Sivaiah, 2013, ISBN: 9789380856476. 4. A Basic Course in Applied Mathematics, by J. Bystrom, L. Persson, F. Stromberg- Lulea University of Technology, 2010			
Supporting websites	1.http://ocw.mit.edu/courses/mathematics/ 2.https://www.youtube.com/watch?v=SS6bniyB7rw 3. https://www.youtube.com/watch?v=9R3-0-Xg_Ro 4. https://www.youtube.com/watch?v=IR_QQDhpwsg			
The physical environment for	✓ Class room	☐ labs	✓ Virtual educational	☐ Others

teaching			platform	
Necessary equipment and software				
Supporting people with special needs				
For technical support				

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Define the Power Series solution technique to Ordinary Differential Equations	**MK1**
K2	Discuss the concept of Fourier series expansion of functions.	**MK2**
K3	Define Fourier solutions of the boundary value problems.	**MK3**
	Skills	
S1	Apply power series methods to solve differential equations and Find the Fourier transform of a function	**MS1**
S2	Compute Fourier series expansion of functions.	**MS2**
	Competences	
C1	Work professionally with different types of ordinary differential equations and Fourier series	**MC1**
C2	Develop the individual's ability to communicate and interact with other mathematical courses.	**MC2**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	**30%**	40%	30%
Participation / practical applications	0	**0**	10%	30%
Asynchronous interactive activities	30%	**20%**	0	0
Final exam	40%	**50%**	50%	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Review of initial value problems, First order I.V.P. Review of power series. Series solution of ordinary differential equation about an ordinary point	Lecture	79 – 87 187-194
2	Classification of ordinary and singular points Frobinius	Lecture	79 –84

	method, Solution around regular singular point, part I.,		207 – 215
3	Solution around regular singular point, part II. Periodic functions, Harmonic functions. The basic trigonometric system	Lecture	215 – 219
4	The orthogonally of sine's & cosines. Normalization of functions. Fourier series of function with period 2π.	Lecture	8 – 14
5	Fourier series for functions defined on an interval with length 2π. Right-hand and Left-hand limits. Jump discontinuities. Smooth and piecewise smooth functions.	Lecture	15 – 18
6	A criterion for convergence of Fourier series. Even and Odd functions, Sine and Cosine series. Half range of sine & cosine Fourier series.	Lecture	19 – 32
7	Change of interval, functions of period 2P A sufficient condition for convergence of a Fourier series at a continuity point.	Lecture	35 – 40 75 – 77
8	A sufficient condition for convergence of a Fourier series at point of discontinuity. Convergence of a Fourier series of a piecewise smooth function.Uniform convergence. **Mid exam 30%**	Lecture	75 – 78 79 – 82
9	Integration of Fourier series. Differentiation of Fourier series, the case of continuous function of period 2π. Differentiation of Fourier series, the case of a function defined on the interval [0, π].	Lecture	125 – 137
10	Parsival's identity. Finite sine Fourier transforms Finite cosine transforms and their properties	Lecture	119-124
11	Generalized sine and cosine transforms. Eigenvalue and Eigenfunction problem, Sturm-Liouville BVP	Lecture	589 – 593
12	Solution around regular singular point, part II. Periodic functions, Harmonic functions. The basic trigonometric system.	Lecture	602 – 615 250
13	Orthogonality of the Eigenfunctions. Fourier series with respect to the Eigenfunction. The generalized solution.	Lecture	251-258
14	Equation of a vibrating string. Free vibrations of a string, Forced vibrations of a string	Lecture	268 – 273
15	Equation of a heat flow of a rod Heat flow of a rod with ends held at zero temperature.	Lecture	296 – 299
16	**Final Exam 40%**		

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Background	Ordinary differential equations	Self-reading and Discussion
2	Video 1 Solving exercises	E-learning	Discussion in the class
3	Homework 1:	(Lecture notes and Ref.1)	Submit a pdf or word sheet
4	Quiz 1	On the subjects studied on the	Submitting on the E-

		first three weeks	learning
5	Assignment 1:	Internet sources and the other Supportive learning resources	Presentation
6	Video 2	Solving exercises	Discussion in the class
7	Homework 2:	(Lecture notes and Ref.1)	Submit a pdf or word sheet
8	Assignment 2:	Internet sources and the other Supportive learning resources	Submitted with the mid exam
9	Self-reading	Power Series	Talk
10	Video3 Solving exercises	E-learning	Discussion in the class
11	Homework 3:	(Lecture notes and Ref.1)	Submit a pdf or word sheet
12	Self-reading	Fourier Series	Talk
13	Quiz 2	On the subjects studied on the subject studied after midexam	Submitting on the E-learning
14	Presentation of the subject:	Internet sources and the reference book	Video
15	Video 4 Revision of all the course	E-learning	Discussion in the class
16	**Final Exam**	-	